ECOSYSTEM STATUS INDICATORS

Nutrients and Productivity

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Nutrients and Productivity Processes in the southeastern Bering Sea

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The southeastern Bering Sea shelf experienced dramatic changes in large-scale climate conditions and local weather conditions during 1997, 1998, and 1999. We investigated the changes in nutrient distribution and primary production in response to the changing physical condition over the shelf region (Rho et al. 2005). Temperature and salinity profiles showed that sea ice conditions and wind-mixing events strongly influenced hydrographic conditions. Biological utilization and physical process, such as horizontal advection below the pycnocline, played an important role in the distribution and interannual variation of nutrients. The distribution of temperature and ammonium across the shelf suggested that there was offshore transport of the middle shelf water at mid-depths over the outer shelf, which may export materials from the middle shelf to the outer shelf and shelf break. The distribution of carbon and nitrogen uptake rates showed large interannual differences due to variations in the development of stratification and nutrient concentrations that resulted from variations in sea ice dynamics and wind mixing over the shelf region. The occurrence of high ammonium in early spring may affect nitrate utilization and result in an increase of total primary production (Rho et al. 2005).

The timing of ice advance and retreat was favorable for an ice-edge phytoplankton bloom in 1997 but not in 1998 or 1999 (Rho et al. 2005). The early ice retreat in 1998 and 1999 in combination with strong wind mixing may have prevented the development of density-driven stratification, resulting in higher nitrate concentrations and a lack of an obvious spring bloom in those years (Rho et al. 2005). Conditions in 1998 and 1999, high ammonium concentrations and strong wind mixing, may have favored dinoflagellate growth (Rho et al. 2005).